



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/802,060 Confirmation No. : 3772
Application of : Richard G. Middleton
Filed : 03/16/2004
Group Art Unit : 1751
Examiner : Derrick G. Hamlin
Docket No. : 23411-33
For : METHOD FOR CLEANING TEXTILE ABSORBERS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. 1.132

Richard G. Middleton, of 1271 First Street S. Extension, Columbia, SC 29209, declares
as follows:

1. I am the sole inventor of the invention described and claimed in the above-listed patent application.
2. My experience in the textile cleaning industry includes being the Founder and President of Circle Environmental, Inc. (1996 – Present), which has its place of business in South Carolina, and which specializes in the cleaning and processing of oil saturated absorbent materials. My company has been at the forefront of environmental issues from its inception, as evidenced by the following awards: 1) winner of the 2001 "Governor's Pollution Prevention Award" for Innovative Absorbant Recycling and Waste

Minimization Programs for South Carolina; and ii) winner of 2001 "Best Waste Reduction Award" from the SC Department of Health and Environmental Control.

3. I, both as an individual and through the above listed company, have been in the business of developing, selling, and installing cleaning processes that can prevent any unnecessary soil and groundwater contamination for over 10 years.

4. In an effort to address the issues facing the cleaning of textile absorbers, including minimum waste generation and maximum recycling and reuse of both the absorbers and the extraneous substances that became absorbed, I developed and patented a method for cleaning absorbent materials. This method included the use of a standard dry cleaning fluid, preferably, perchloroethylene.

5. Although the use of perchloroethylene as a dry cleaning fluid accomplished the recycling and reuse of absorbent materials, as well as the extraneous substances absorbed by these material, waste generation remained an issue. There exist growing concerns throughout the country regarding typical dry cleaning fluids, such as perchloroethylene. Because various local, state, and federal agencies consider these dry cleaning fluids to be hazardous wastes, the use of them in a cleaning step necessitates their treatment and/or disposal. Not only is hazardous waste disposal costly, but it imposes significant requirements for careful handling in order to protect the environment. Perchloroethylene is also considered to be a health hazard to those that may become over exposed to its fumes if not properly handled and ventilated.

6. Currently, the following mandatory requirements apply to operators using perchloroethylene in dry cleaning in South Carolina:

A. Requirements of Bureau of Land & Waste Disposal

i) an operator must obtain an EPA ID# so that EPA can track the amounts of hazardous waste is produced;

ii) disposal cost per 55 gallon drum of residual perchloroethylene or still bottoms containing perchloroethylene is at least \$80.00;

iii) monthly, quarterly, and yearly reports of Hazardous Waste generated;

iv) yearly payments to the dry cleaning restoration fund;

B. Requirements of Air Quality and Emissions

i) stringent construction permit required before installation of equipment;

ii) apply for air permit after obtaining construction permit;

iii) complete daily, weekly, monthly, and yearly reports;

iv) Title V permit required when operator reaches level of usage.

7. Additional costs that are not mandatory, but necessary nonetheless, include costs for environmental compliance experts to assist in understanding constantly changing regulations and permits.

8. Not only did these growing concerns and expenses affect whether continued use of perchloroethylene as a dry cleaning fluid was a preferred choice, but also, I learned that at least one state, California, is considering banning the use of perchloroethylene as a dry cleaning fluid altogether. Accordingly, this potentially growing trend in the United

States to ban the use of perchloroethylene as a dry cleaning fluid encouraged me to begin considering alternatives.

9. The use of n-propyl bromide as a substitute to perchloroethylene was not an obvious choice. N-propyl bromide is much more costly than perchloroethylene, and can cost as much as three times more than perchloroethylene. However, this material has been previously used in combination with other materials as a degreasing agent. Because my cleaning process often focused on the removal of oil-based or grease-based extraneous substances, n-propyl bromide was tested as a potential substitute.

10. The results from the use of n-propyl bromide as a dry cleaning fluid proved to be significantly better than anticipated, if not surprisingly better. The following summarizes what I believe to be the superior and unexpected results of using n-propyl bromide as a dry cleaning fluid:

i) Lower Energy Costs - N-propyl bromide can be reclaimed through distillation more efficiently than perchloroethylene. Accordingly, less energy is employed in heating n-propyl bromide to its distillation point, which is from about 70°F to about 150°F, depending on various operating conditions, as compared to about 250°F for perchloroethylene under the same operating conditions. Further, the lower boiling point of n-propyl bromide than that of perchloroethylene contributes to shorter drying times to remove dry cleaning fluid from the fabrics being drycleaned. In a comparison between energy expenses incurred when using

perchloroethylene versus n-propyl bromide as a dry cleaning fluid, the total average monthly energy costs for my cleaning process was \$2199.44 when perchloroethylene was used, and these costs were reduced to \$1566.17 when the process included n-propyl bromide as the dry cleaning fluid¹;

ii) Less State and Federal Regulations - N-propyl bromide is currently not considered a hazardous substance. Therefore, significantly less time and cost is spent on compliance with regulations permits that would otherwise apply to the use of perchloroethylene. I have attached an Inspection Report from the Department of Health and Environmental Control for South Carolina, which states that by using n-propyl bromide in the dry cleaning process, my company can change from a title V permit to a State Source. In doing so, the reporting and compliance of federal regulation has been removed. Moreover, there is a disposal cost for hazardous substances, such as perchloroethylene, that is about \$80.00 on up for each 55 gallon drum of residual or still bottoms. On average, my company disposed of roughly 23 gallons of used perchloroethylene per month for a cost of \$1840.00 per month. There is no cost for disposal of n-propyl bromide residual and still bottom;

iii) Safer Working Conditions - Upon information and belief, n-propyl bromide is less regulated by state and federal regulations because it is a safer material than perchloroethylene. Therefore, working conditions are also safer as a result;

¹ These figures were taken from a six month, side-by-side comparison of electric and gas bills.

iv) Less Stress on Equipment - The density of n-propyl bromide, which is about 11.6 pounds per gallon, is lower than the density of perchloroethylene, which is about 14 pounds per gallon, therefore, less stress is placed on the equipment during the washing, drying, and reclaiming cycles of the dry cleaning process.

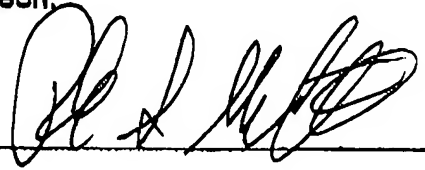
v) Less Dry Cleaning Fluid Needed To Clean the Same Amount of Textiles – Based on a review of amount of perchloroethylene purchased over a nine month period versus the amount of n-propyl bromide purchased in a consecutive nine month period, 52,960 pounds of perchloroethylene were purchased and only 27,600 pounds of n-propyl bromide were purchased, respectively. Although this difference can partly be attributed to the differences in densities between the two materials, the data also suggests that n-propyl bromide can be reclaimed more efficiently.

11. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like are punishable by fine and/or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that any such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

Date:

3/14/2005

By:



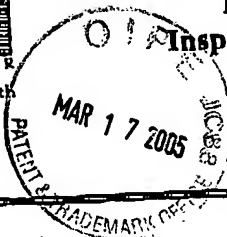
Richard G. Middleton



South Carolina Department of Health
and Environmental Control

Environmental Quality Control
Bureau of Air Quality
Inspection/Investigation Report

Central Midlands District
Building 5
State Park, SC 29147
(803) 896-0620 Fax (803) 896-0617



Source(Project): Circle Environmental
Source No.: 1900-0164
Mailing Address: 1271 First Street S. Ext.
Columbia, SC 29209
Source Address: 1271 First St. S. Ext.
Columbia, SC 29209
County: Richland

Date/Time: 04/03/22 @ 1500
Type: Comprehensive
Owner/Operator: Marion Lesesne III
Person Contacted: Same
Source Telephone: 803-695-9700
Code: MA01X
Inspector: Robert W. Hudson

This company operates a waste minimization program for hazardous fluids in an industrial application. Operations are permitted under Part 70 Permit Number TV-1900-0164, Issue date February 21, 2002, Effective April 1, 2002 and Expiration Date: March 31, 2007. Permit application 1900-0164-CD has been made and approved to also use N-propyl Bromide (VOC), which is now used in current operations. Clean-up rags and pads soiled with hydraulic fluids are cleaned in dry cleaning machines for reuse. Also experimentation is being conducted in dry cleaning of oil spill containment materials. The following is a list of permitted equipment at this location:

ID NO.

DESCRIPTION

01

80 pound Columbia Turbo Dry, Model 1231 dry-to-dry cleaning machine equipped with a primary refrigeration unit with secondary aeration filter system rated at 99% efficiency (perchloroethylene solvent is used to clean synthetic clothing; this unit is subject to Part 63 NESHAP, Subpart M) (CB)

02

160 pound Columbia, Model TL1400/MD1500 dry-to-dry cleaning machine equipped with a primary refrigeration unit with secondary aeration filter system rated at 99% efficiency (perchloroethylene solvent is used to clean synthetic clothing; this unit is subject to Part 63 NESHAP, Subpart M) (CB)

Currently the 160 pound cleaning machine listed as ID 02 is in use the 80 pound machine has been sold, but remains on site. Rolling sum HAPs is 29.28 tons year through end of February, 2004. Operators maintained a log book to record permit requirements including leak checks, inspections of hoses and pipe connections, fittings, couplings, and valves. Also door gaskets and seatings, filter gaskets and seatings, pumps, solvent tanks and containers, and water separators. At the time of inspection condenser #1 outlet was 35° C and inlet was 10° C, condenser #2 outlet

Source(Project): Circle Environmental**Date/Time:** 04/03/22 @ 1500

was 42° C and inlet was 6° C. on the 160 pound cleaning machine. Using the new material will allow operators to request a change from title V to a State Source. The new construction permit requires that records be maintained of the quantity of N-Propyl Bromide (VOC). Consumption is limited to 100 tons per year under the new construction permit. No violations of permit requirements or applicable regulations were observed during this inspection.